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EXHIBIT I

UNITED STATES PATENT APPLICATION FOR:

**PROCESS FOR ETCHING A CONTROLLABLE THICKNESS OF OXIDE ON AN
INTEGRATED CIRCUIT STRUCTURE ON A SEMICONDUCTOR SUBSTRATE
USING NITROGEN PLASMA AND AN RF BIAS APPLIED TO THE SUBSTRATE**

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19. A process for etching away a fixed thickness of silicon oxide in an integrated circuit structure on a semiconductor substrate which comprises:

- a) placing said semiconductor substrate on a substrate support in an etching chamber of an etching apparatus, said chamber maintained at a pressure of from about 1 millitorr to about 500 millitorr;
- b) exposing an oxide surface of an integrated circuit structure on a semiconductor substrate to a nitrogen plasma maintained at a power level of from about 250 watts to about 500 watts and formed by flowing a gas containing nitrogen into said etching apparatus, and then igniting a plasma in said etching apparatus; and
- c) maintaining, on said substrate support, during said exposure of said oxide surface to said nitrogen plasma, an rf bias at a power level ranging from above zero up to about 100 watts;

whereby a fixed thickness of silicon oxide will be removed from said oxide surface, with the oxide thickness removed dependent upon said power level of said rf bias on said semiconductor substrate.

20. The process for etching away a fixed thickness of silicon oxide of claim 19 wherein said power level of said rf bias on said substrate ranges from above zero up to about 50 watts.

21. The process for etching away a fixed thickness of silicon oxide of claim 19 wherein said oxide surface exposed to said nitrogen plasma comprises an oxide layer previously formed on said integrated circuit structure.

22. The process for etching away a fixed thickness of silicon oxide of claim 19 wherein said etching chamber is maintained at a pressure of from about 1 millitorr to about 200 millitorr.

23. The process for etching away a fixed thickness of silicon oxide of claim 19 wherein said nitrogen plasma comprises a remote plasma.

ABSTRACT OF THE INVENTION

5 A process for etching oxide is disclosed wherein a reproducibly accurate and uniform amount of silicon oxide can be removed from a surface of an oxide previously formed over a semiconductor substrate by exposing the oxide to a nitrogen plasma in an etch chamber while applying an rf bias to a substrate support on which the substrate is supported in the etch chamber. The thickness of the oxide removed in a given period of time may be changed by changing the amount of rf bias applied to the substrate through the substrate support.

PLACING ON A SUBSTRATE SUPPORT IN AN ETCH CHAMBER A SEMICONDUCTOR SUBSTRATE HAVING AN EXPOSED OXIDE SURFACE THEREON

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graph TD; A[PLACING ON A SUBSTRATE SUPPORT IN AN ETCH CHAMBER A SEMICONDUCTOR SUBSTRATE HAVING AN EXPOSED OXIDE SURFACE THEREON] --> B[FLOWING A GAS CONTAINING NITROGEN INTO THE ETCH CHAMBER]; B --> C[APPLYING AN RF BIAS OF PREDETERMINED POWER LEVEL TO THE SUBSTRATE SUPPORT IN THE ETCH CHAMBER]; C --> D[FORMING A NITROGEN PLASMA IN THE CHAMBER WHILE CONTINUING TO FLOW THE GAS CONTAINING NITROGEN INTO THE ETCH CHAMBER AND WHILE CONTINUING TO APPLY THE RF BIAS TO THE SUBSTRATE SUPPORT]; D --> E[EXTINGUISHING THE PLASMA AFTER A PREDETERMINED PERIOD OF TIME]; E --> F[WHEREBY A REPRODUCIBLY FIXED THICKNESS OF OXIDE WILL BE REMOVED FROM THE OXIDE SURFACE, WITH THE AMOUNT OF REMOVED OXIDE DEPENDENT ON THE RF BIAS POWER APPLIED TO THE SUBSTRATE, AND THE ETCH TIME];
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FLOWING A GAS CONTAINING NITROGEN INTO THE ETCH CHAMBER

APPLYING AN RF BIAS OF PREDETERMINED POWER LEVEL TO THE SUBSTRATE SUPPORT IN THE ETCH CHAMBER

FORMING A NITROGEN PLASMA IN THE CHAMBER WHILE CONTINUING TO FLOW THE GAS CONTAINING NITROGEN INTO THE ETCH CHAMBER AND WHILE CONTINUING TO APPLY THE RF BIAS TO THE SUBSTRATE SUPPORT

EXTINGUISHING THE PLASMA AFTER A PREDETERMINED PERIOD OF TIME

WHEREBY A REPRODUCIBLY FIXED THICKNESS OF OXIDE WILL BE REMOVED FROM THE OXIDE SURFACE, WITH THE AMOUNT OF REMOVED OXIDE DEPENDENT ON THE RF BIAS POWER APPLIED TO THE SUBSTRATE, AND THE ETCH TIME